

Effective Communication



ELEC 3040/ELEC 3050
J. Y. Hung & V. P. Nelson



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Enhancements by Stu Wentworth



Why is this topic important?

- Employers rank communication skills #2 behind technical expertise as desired traits for new engineers
 - 20-25% of engineers' time spent writing
 - 70-75% of time communicating (reading, writing, speaking & listening)
 - Good communication skills enhance professional advancement opportunities

Other reasons/benefits

- Putting thoughts on paper helps organize and refine ideas
- Written material & oral presentations can persuade an audience to support your effort (financially or otherwise)
- Preserve your work as a starting point for future work



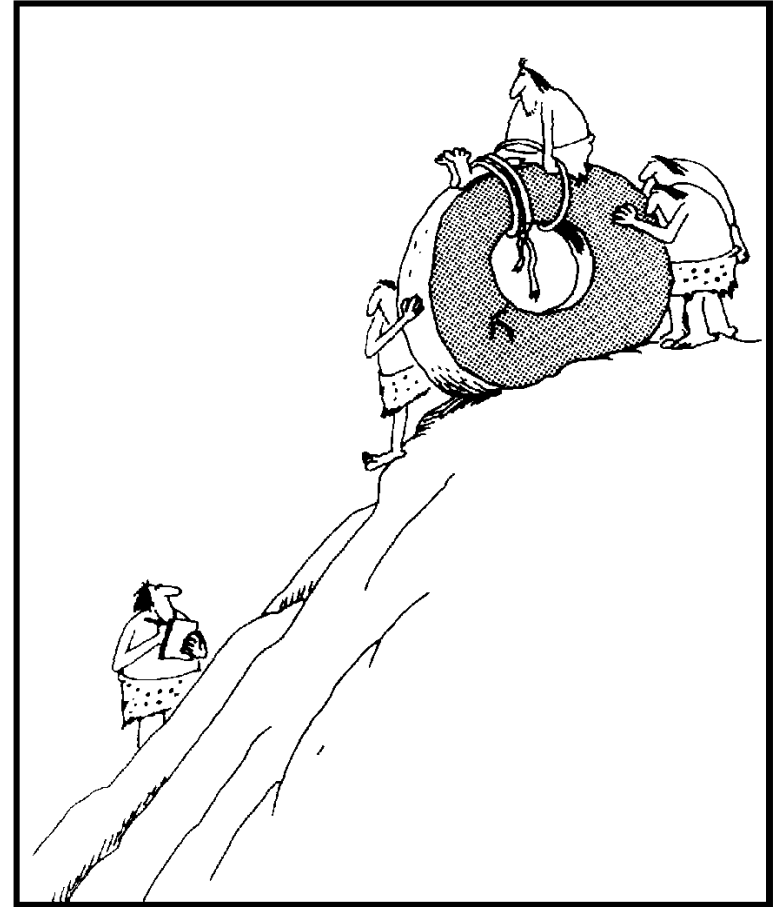
Leonardo Da Vinci

http://www.bbc.co.uk/southyorkshire/content/image_galleries/treasures_v_and_a_beauchief_bishops_house_gallery.shtml?26

Design project documents

(some or all may apply)

- Pre-proposal/project abstract
- Proposal
- Project plan
- **Progress reports**
- Test plan
- **Report on test results**
- **Design report**
- User manual
 - End-user documentation
- Various memoranda
- **Engineering notebook**



Early experiments in transportation

<http://www.gocomics.com/theflyingmccoys/2010/02/20/>

Seven steps to a successful document

- Divide responsibilities (for “team” document)
- Determine tone, style, length & format
- Develop an outline
- Write a draft
- Revise and proofread
- Review (peer and other) & revise again
- Generate the final document

Divide responsibilities

- Team members write sections with which they are familiar
- Team “editor” integrates sections, ensuring consistency and good flow between them
- Use the same or compatible word processor & related software (charts, schematics, etc.)
- Large industrial projects are often assigned a technical writer to assist the engineering team

Overall look & feel of a document

(need to sell your ideas)

- Match writing style and tone to your audience
 - Peers, managers, technical people, ...
 - Use appropriate terminology & use it properly
- Convey to readers your knowledge of the project
- Clearly define report sections with headings
- Avoid use of 1st person in technical reports (unless it's awkward to avoid it)

Not: We did this ...

Instead: The project team did this ...

- Spell out acronyms 1st time used

Ex. pulse width modulated (PWM) signal ...

Then use PWM in the remainder of the document.

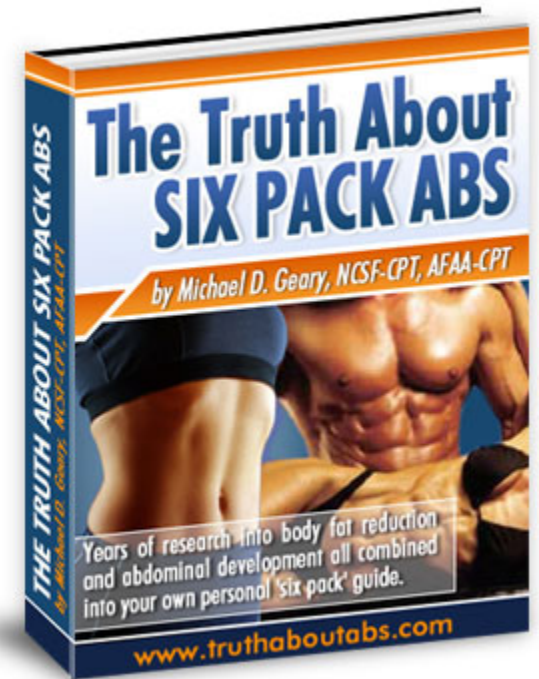
Format, layout, fonts, etc

(make it look professional)

- 11 or 12-point font (<14 for section headings)
- Single or 1 ½ line spacing
- Top/bottom margins 1-1.5”, left/right margins ¾ - 1”
- Page numbers (in header or footer) after title page:
 - Arabic numerals for body (1, 2, 3...)
 - Lower case Roman numerals (i, ii, iii, ...) for prefatory pages
- Use “bullet points” to break up lists of items, rather than merging them within a paragraph
- Avoid overuse of **bold**, underline, *italics*, **color**, & other “special effects” (can be distracting)
 - **Boldface** for section headings
 - *Italicize for emphasis* where necessary

The “body” of a report

- Basic structure (from high school):
 1. Say what you’re going to say
 2. Say it
 3. Say what you said
- Some may read only the introduction and/or conclusions
- Introduce the reader to the problem and provide sufficient context to understand the discussion
 - Give “high level” descriptions before details
- Place supplementary material in appendices (schematics, software listings, etc.)



Report body organization

- Intro - what is the problem to be solved?
- What prior work has been done?
- What is your solution to the problem?
- What alternative solutions were considered, and why were they not used?
- How did you deal with various constraints?
- How was your design implemented?
- How was your design tested?
- How well did the design meet the specifications?
- Overall summary (*might be all that is actually read*)
- Future work – what remains to be done?

Figures & tables

- Each should **contribute** to the discussion – assist reader in visualizing a design/concept/data ...
 - Some readers might just flip through figures/tables
- Use a caption to summarize each figure's content:
 - Ex. *Figure 1. System block diagram*
- Reference figures/tables by number:
 - Ex. *As can be seen in Figure 1,*
 - Not: *As can be seen in the figure below,*
- Figures/tables should be readable with ordinary effort
 - avoid too much detail & small fonts
 - neither too large nor too small
- Label all axes on graphs/charts

References

- Cite published work related to your project
 - Properly credit items from sources used in the report
 - Convince reader you've researched the problem
 - Provide additional sources of information
- Number references [1,2] in the order cited in the text [3].
- Provide complete references at the end
 1. Bystrom, M. and Eisenstein, B., *Practical Engineering Design*, CRC Press, 2005
 2. Nelson, V.P., "Design of Hula Hoops", IEEE Trans. on Toy Design, Vol. 8, No. 5, June 2004, pp. 5-9.
 3. *Intel 8051 Product Manual*, <http://www.intel.com>

A reader should be able to locate a reference from the citation information.

Writing performance indicators/rubrics

Program Outcome 8: Proficiency in communicating ideas and information orally and in writing.

ELEC 4000 – Senior Design Final Report

ELEC 3040/3050/3060 – Final Lab Report

ELEC 3030 – Final Lab Report

		Rubric			
		1 – Unsatisfactory	2 – Developing	3 – Meets expectations	4 – Exceeds expectations
Performance Indicators	Content	Inconsistent or few details that may interfere with the meaning of the text.	Some details, but may include extraneous or loosely related material.	Provides adequate supporting detail to support solution/argument.	Provides ample supporting detail to support solution/argument.
	Organization	Little evidence of organization or any sense of wholeness and completeness.	Little completeness and wholeness, though organization is attempted.	Organizational pattern is logical and conveys completeness and wholeness with few lapses.	Organizational pattern is logical and conveys completeness and wholeness.
	Style	Limited or inappropriate vocabulary for the intended audience and purpose.	Limited and predictable vocabulary, perhaps not appropriate for intended audience and purpose.	Uses effective language and appropriate word choices for intended audience and purpose.	Uses effective language; makes engaging, appropriate word choices for audience and purpose.
	Grammar	Does not follow rules of standard English.	Generally does not follow the rules for standard English.	Generally follows the rules for standard English	Consistently follows the rules of standard English.
	Figures/Tables	Figures and tables do not support the text, or are poorly designed.	Figures and tables sometimes support the text, and sometimes well designed.	Figures and tables generally support the text, and are usually well designed.	Figures and tables always support the text, and are well designed.
	Use of sources	Sources consistently not cited for material used in the report.	Sources not cited for some material used in the report, or inappropriate sources cited.	Sources cited for material used in the report. Most of the sources are appropriate to support the discussion.	Sources cited for material used in the report. All sources support the discussion.

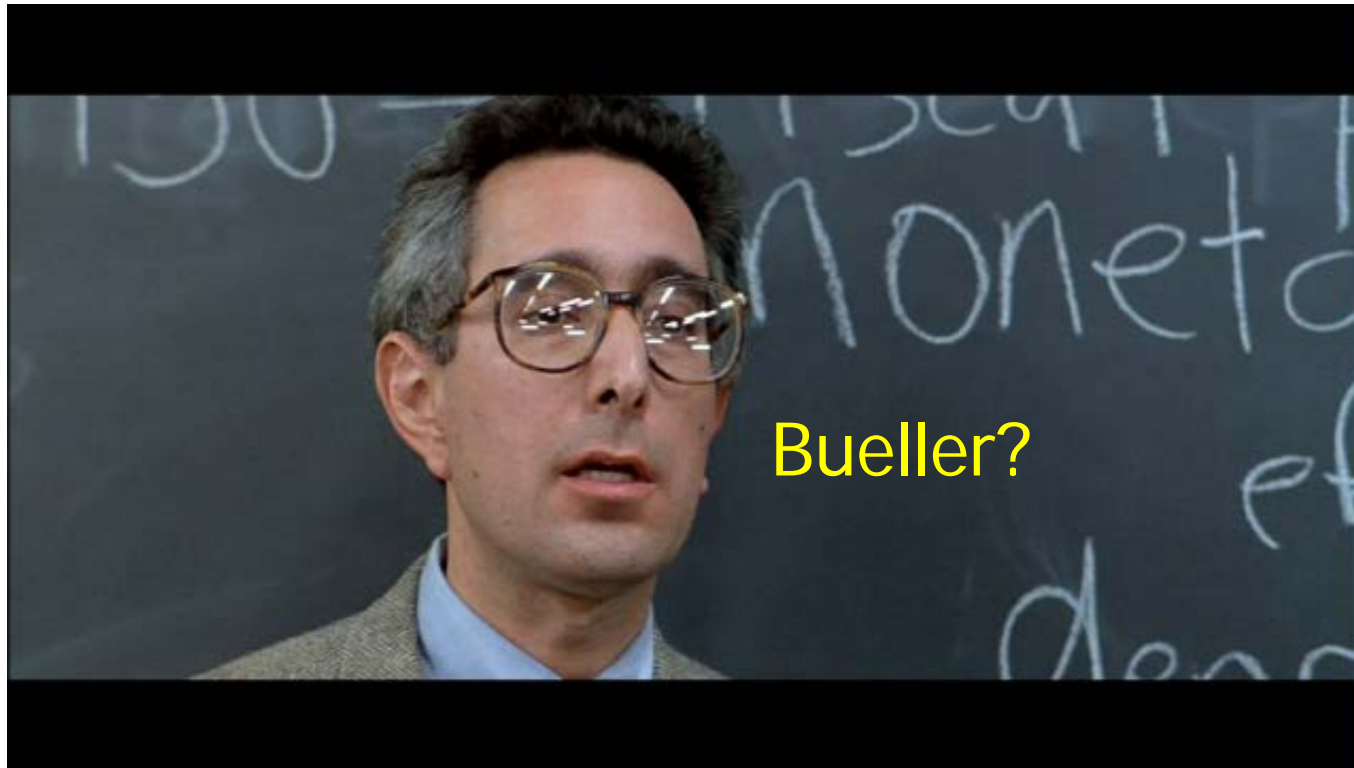
COMMENTS:

Oral Presentations

- Most guidelines for written documents apply
 - Consider who your audience is.
 - What do you want the audience to take from your presentation?
- Plan and practice your presentation & timing
- Use appropriate graphics
- Don't substitute "glitz" for "substance"
(especially distracting PowerPoint *animations*)
- Show enthusiasm & professional demeanor
- Speak to the audience – make eye contact
- Consider, in advance, how you will answer questions

Don't:

- speak in monotone
- read your slides
- look bored with your own presentation
- use annoying mannerisms
- use placeholders (ok, you know, like, actually, uh...)



Do:

- Personalize your talk (humor, quotes...)
- make eye contact
- speak loudly, vary your tone and pace
- ask questions
- **practice!!!**



Use a very large font

40 point 28 point 18 point 12 point

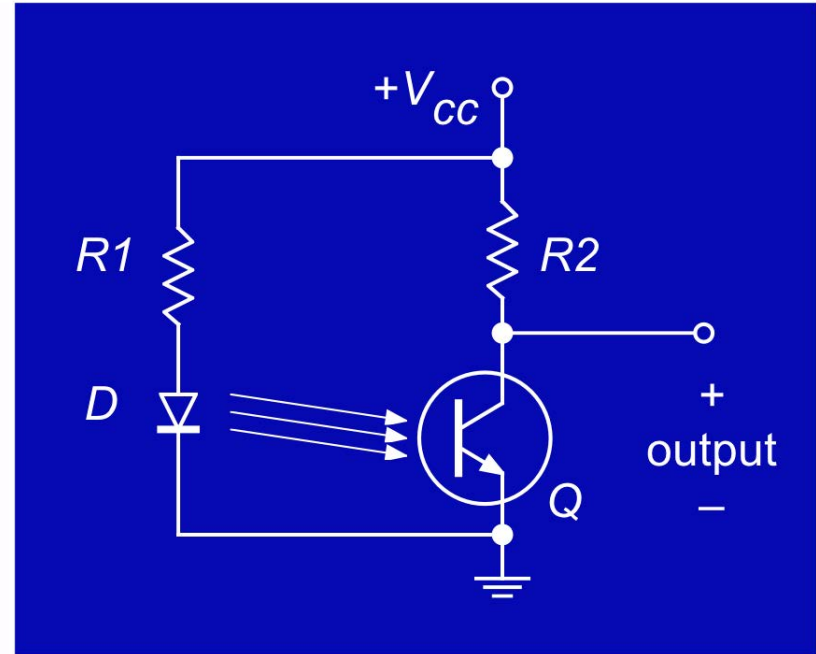
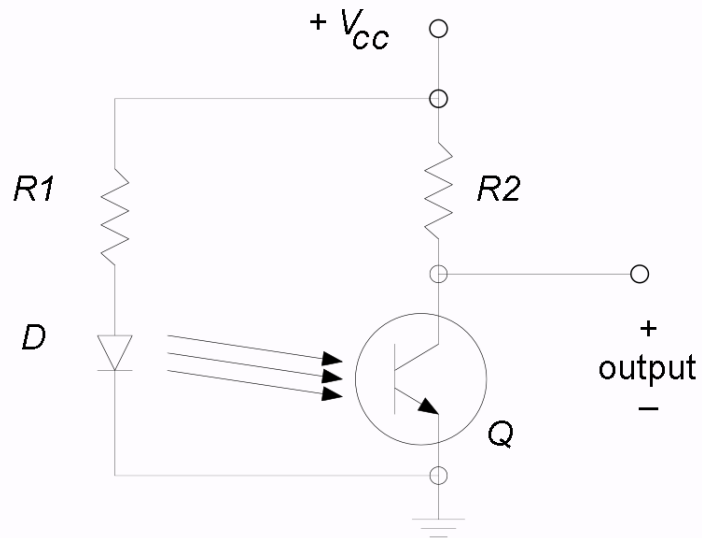
- use a small number of lines per slide
- key words & phrases rather than sentences
- proofread for spelling!
- go easy on the equations
- don't overdo color

Effective Visuals

Help the audience visualize what you are trying to describe

1. Good visibility
2. Simplicity
3. Manageability

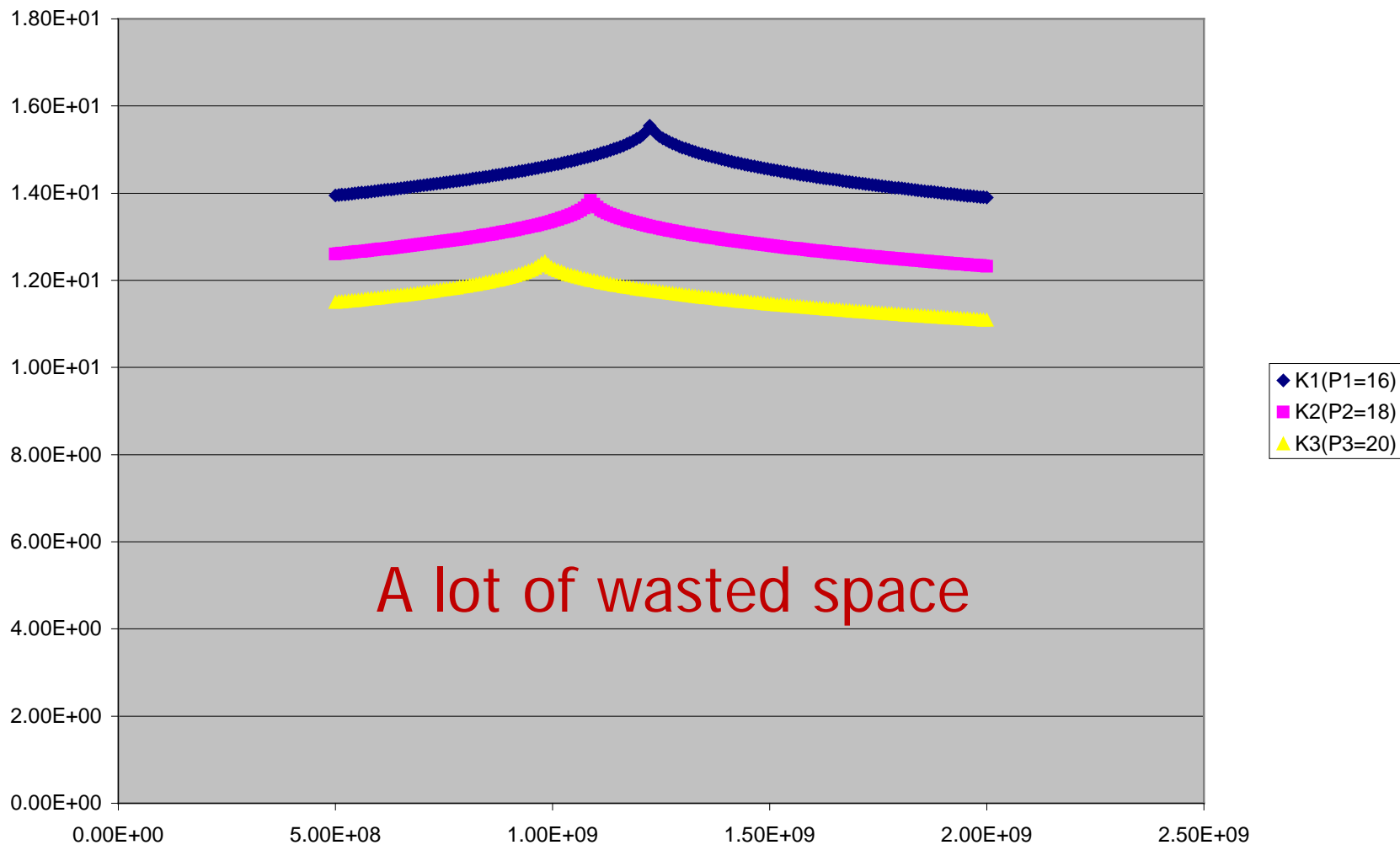
Make figures audience-friendly



Can you comfortably read these diagrams?

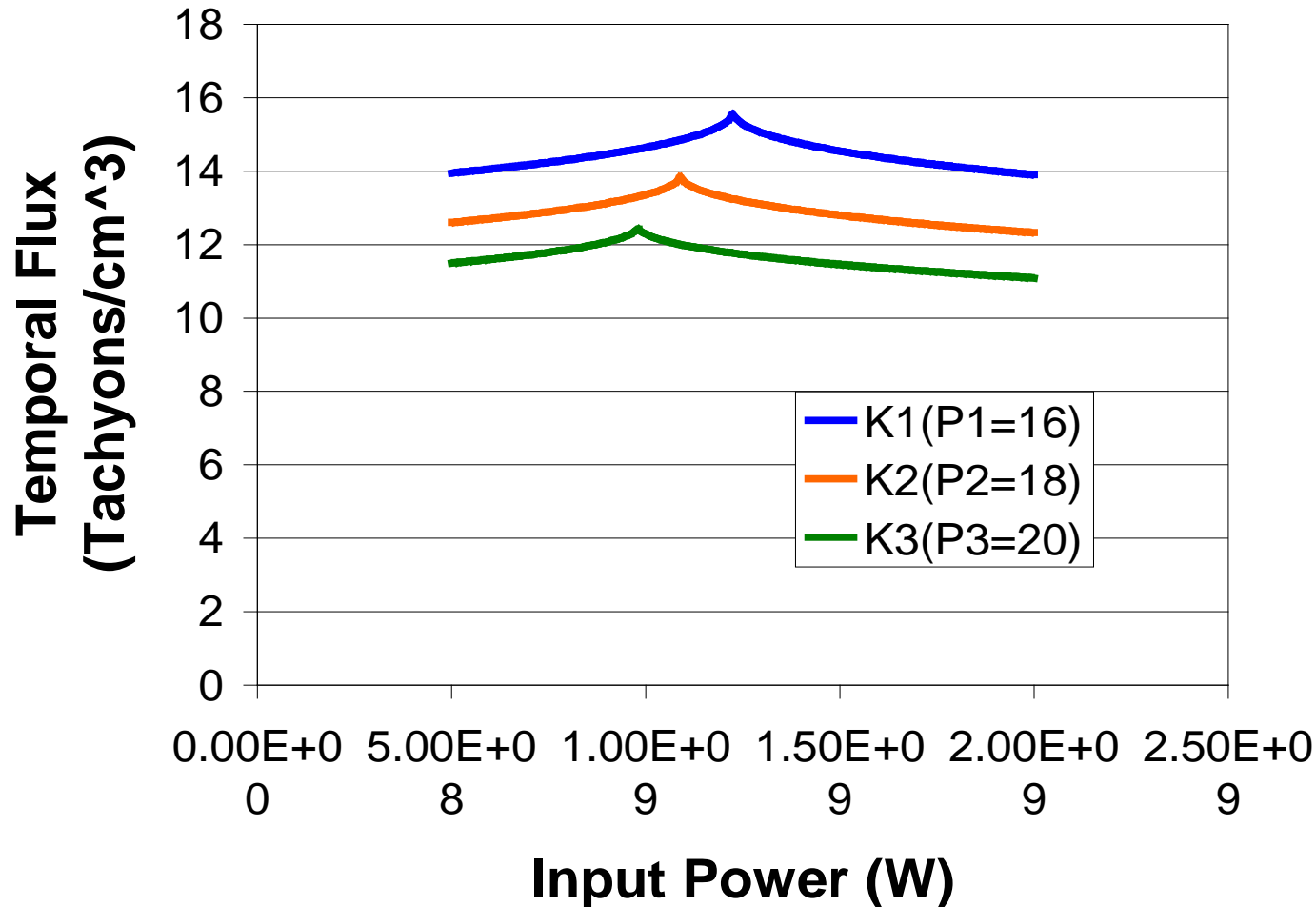
(example of a **bad** plot)

temporal flux vs Plinth Setting for different power inputs



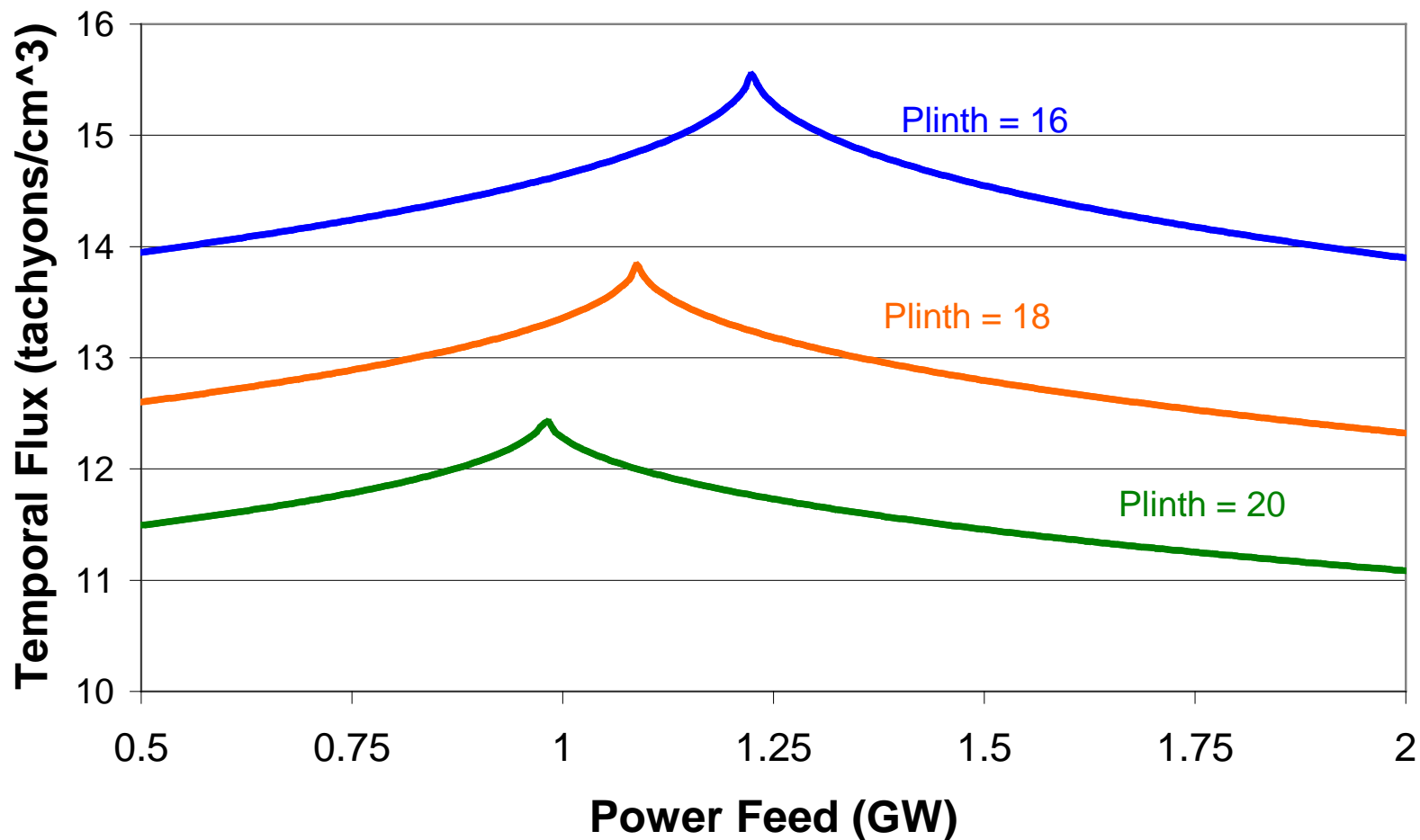
(example of an improved, but still **poor** plot)

Temporal Flux Comparison



(example of a **better** plot)

Temporal Flux Comparison



A Wasted Visual

The Temperature Control Project

Introduction

Objectives

Solution

Conclusions

A Better Visual

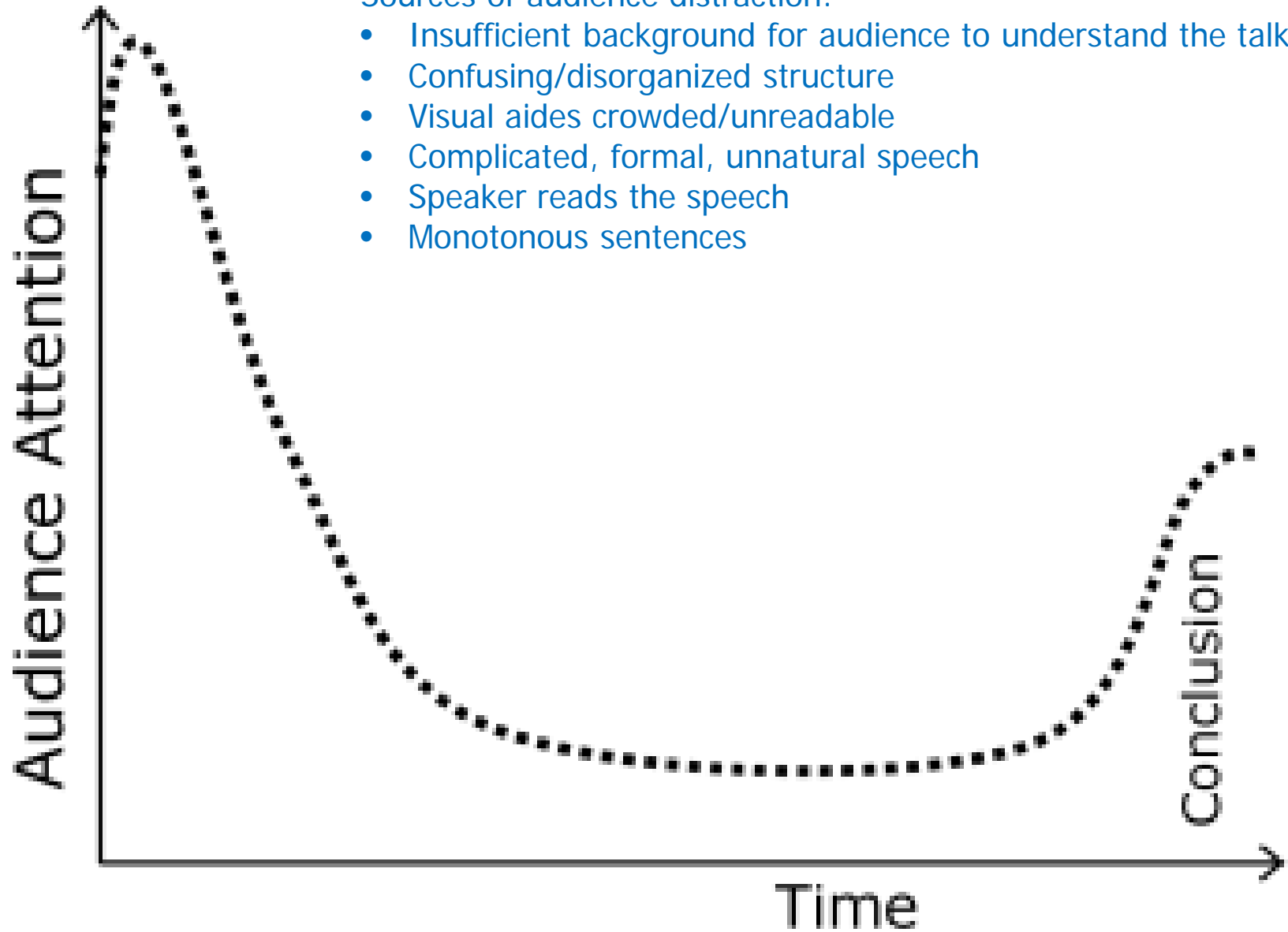
The Temperature Control Project

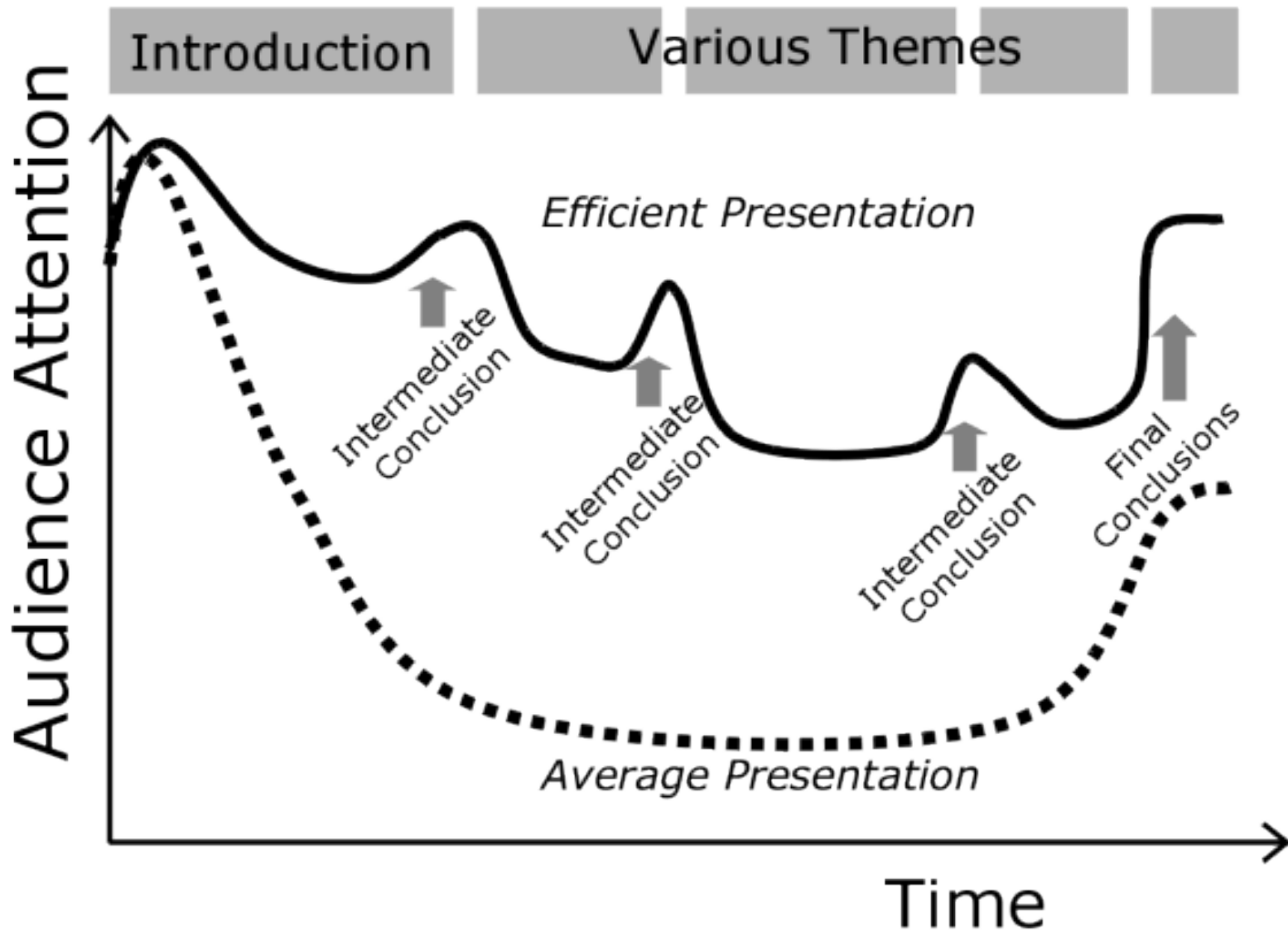
1. **Objective** – maintain temp
2. **Solution** – IC sensor, μ controller, fan control
3. **Future work** – high fan power

Other tips



- don't downplay your own expertise
- stay within your allotted time...
- but don't go too fast!
- go over big ideas twice
- consider audience attention span...





Top 10 Tips to an Awful Presentation

1. Go with the flow, because audiences enjoy spontaneity and surprises. Don't worry about time, since no one minds the duration of really good presentations.
2. Start preparation at 3 a.m., with caffeine and donuts for support.
3. Leave equipment checks to your partner, since you have to concentrate on other things for the presentation.
4. Impress the audience with your erudition.
5. Fiddle with something to hide nervousness.

This slide breaks a fundamental rule: Too much stuff on one slide!

Top 10 Tips to an Awful Show (continued)

6. Have lots of visuals on hand, and go through them quickly to keep the viewers on the edge of their seats.
7. Pack the visuals with data, so the audience can read anything that you forget to discuss.
8. Emulate a professor: Give the audience everything — and the kitchen sink!
9. Avoid eye contact, as it might distract you.
10. Take no questions from the audience, since questions open tiresome debate.

Also too much stuff on one slide!

ELEC 3040/3050/3060 Oral Presentation Rubric

Adapted from NCTE Rubric (National Council of Teachers of English)

Student _____

Partner _____

TRAIT	Advanced	Competent	Developing	Unsatisfactory
NONVERBAL SKILLS				
EYE CONTACT	Holds attention of entire audience with the use of direct eye contact, seldom looking at notes.	Consistent use of direct eye contact with audience, but still returns to notes.	Displayed minimal eye contact with audience, while reading mostly from notes.	No eye contact with audience, as entire report is read from notes.
POISE & BODY LANGUAGE	Movements seem fluid and help the audience visualize. Displays relaxed, self-confident nature about self, with no mistakes.	Made movements or gestures that enhances articulation. Makes minor mistakes, but quickly recovers from them; displays little or no tension.	Very little movement or descriptive gestures. Displays mild tension; has trouble recovering from mistakes.	No movement or descriptive gestures. Tension and nervousness is obvious; has trouble recovering from mistakes.
VERBAL SKILLS				
ENTHUSIASM	Demonstrates a strong, positive feeling about topic during entire presentation.	Occasionally shows positive feelings about topic.	Shows some negativity toward topic presented.	Shows absolutely no interest in topic presented.
ELOCUTION	Clear voice and correct, precise pronunciation of terms, so that all audience members can hear presentation.	Voice is clear with correct pronunciation of most words; most audience members can hear presentation.	Voice is low and/or incorrectly pronounces terms; audience members have difficulty hearing presentation.	Student mumbles, incorrectly pronounces terms, and/or speaks too quietly for a majority of audience members to hear.
CONTENT				
SUBJECT KNOWLEDGE	Demonstrates full knowledge during presentation. Answers all class questions with explanations and elaboration.	Demonstrates knowledge during presentation. At ease with expected answers to all questions, without elaboration.	Uncomfortable with information. Able to answer only rudimentary questions.	Does not have grasp of information. Cannot answer questions about subject.
ORGANIZATION	Information presented in a logical, interesting sequence, which audience can follow. Well prepared.	Information presented in a logical sequence, which audience can follow. Adequately prepared.	Audience has difficulty following presentation because speaker jumps around. Marginally prepared.	Audience cannot understand presentation because there is no sequence of information. Inadequately prepared.
LANGUAGE & STYLE	Style, language and terminology especially appropriate for the audience.	Style, language and terminology mostly appropriate for audience.	Style, language and terminology sometimes appropriate for the audience.	Style, language and/or terminology often inappropriate for the audience.
VISUALS	Excellent visuals that enhance understanding of presented information.	Appropriate visuals are used and explained by the speaker.	Visuals are used but not explained, some visuals difficult to view.	Little or no visuals, too much text on slides, or figures unreadable.

COMMENTS:

References

- Practical Engineering Design, Maja Bystrom & Bruce Eisenstein, CRC Press, 2005
- Engineering Design for Electrical Engineers, Alan D. Wilcox, Prentice-Hall, 1990
- Writing and Speaking in the Technology Professions: A Practical Guide, 2nd Ed., David F. Beer (Editor)
- J. Gallian, *Advice on Giving a Good PowerPoint Presentation*,
<http://www.d.umn.edu/~jgallian/goodPPtalk.pdf>
- *How to give a successful oral presentation*
<http://www.catalysis.nl/links/presentations/presentation.php>